Standard Specification for ESB MV/LV Networks Ducting (Minimum Standards)

Note 1: ESB Networks reserves the right not to accept ducting which does not conform to these standards and dimensions.

Note 2: Refer to ESB Networks for Specific Job Specification. These instructions do not apply to 38kV/110kV/220kV cable.

Note 3: All materials (ducts, marker tapes/straps, duct surrounds, mandrels and brushes) must be ESB approved materials.

1. MINIMUM depths below finished ground level

Depth is measured to top of duct.
Max depth is 1m except at:
- service crossings where 1.5m is allowed
- short rail and road crossings where up to 2.5m is allowed.

2A. Minimum Standard Clearances to Other Services

- Clearance to Normal Services: 300 mm
- Clearance to: Large Pipelines / High Pressure Pipes: 600 mm

- To achieve these clearances see sections 3D and 3E below.
- Clearances less than the above at pinch points and crossings requires placement of additional mechanical protection (concrete slab/brick) and agreement of ESB.
- ESB ducts must never be laid over other services on parallel runs, except with the written prior agreement of the other utilities and ESB.
- Other Services must never be laid directly over ESB ducts on parallel runs.

2B. Trench Installation Sequence

1. Warning:
   - Always agree trench route with ESB before excavation commences.
   - Unstable, insecure & poor access routes will not be accepted by ESB.

2. Excavate trench to required dimensions.
   - Ensure loose material and protruding stones are removed.

3. Lay & compact a bedding layer of approved material to a min thickness of 50mm or as otherwise specified.

4. Lay ducts and horizontal spacer on 50mm bedding layer, maintaining specified clearances.

5. For multiple circuits ensure ducts are spaced as per ESB 3 below with a min of 150mm duct spacing.

6. Lay and compact a layer of approved backfill to a depth of 200/250mm above ducting layer.

7. Install ESB approved red marker MI: on top of approved compacted backfill.

8. Lay and compact a layer of approved backfill maintaining a min depth of 100mm to the surface.

9. Install ESB approved yellow marker tape. The max depth for the marker tape is 300mm from finished ground level.

10. Reinstall final layer of backfill per agreed Land Owner Specification.

3A. Minimum Duct Spacings for ESB Ducts

75mm minimum duct spacing for up to two ducts in any layer.

Duct crossovers not allowed at any point along route.

3B. Minimum Duct Spacings for ESB Ducts

150mm duct spacing required for more than 2 ducts in any layer.

Duct crossovers not allowed at any point along route.
3C Minimum Duct Spacings for ESB Ducts

Minimum duct to trench wall clearances and minimum bedding depths

PL & others

Trench Service

Liner Protection

Well Pressure Tape

N.B. 50mm minimum depth of compacted approved backfill above duct top

3D Minimum Duct Spacings for ESB Ducts

Achievement of Horizontal Duct Spacing

Plan View

Horizontal Spacers

Use 75mm or 150mm temporary timber/brick or plastic spacers as appropriate to establish horizontal duct spacing during construction

NB Use 300mm or 600mm horizontal spacers to achieve horizontal spacing from other utilities as appropriate

Timber/Brick Spacers

Customised 75mm or 150mm

Plastic Horizontal Spacers

3E Minimum Duct Spacings for ESB Ducts

Achievement of Vertical Duct Spacing

STEP 1 Lay in Ducts and horizontal spacer Lay in 50mm bedding Layer

STEP 2 Lay in and compact approved backfill to 200/275mm depth depending on spacing in 3A/3B above

STEP 3 Check depth of approved backfill above 1st duct layer and lay in 2nd layer of ducts and spacers on top of sand layer

N.B. Vertical Duct Spacers are not allowed anywhere as they create point loading of ducts. Refer to 3A/3B for spacings in specific situations

4A Installation of Special ESB marked Yellow Marker Tape in all Footways

ESB yellow marker tape and red marker strip is to be used on all carriageways and on grassed areas for both LV & MV cables

300mm Maximum for ESB yellow marker tape

75mm minimum above duct for ESB red marker strip

ESB yellow marker tape and red marker strip widths must always be wider than ducts beneath

4B Installation of Special ESB marked Yellow Marker Tape in all Footways

ESB approved yellow marker tape to be used on all footways

300mm Maximum for ESB yellow marker tape

CAUTION ELECTRIC CABLE

ESB yellow marker tape width must always be wider than width of ducts beneath

ESB Yellow marker tape must never be laid directly on top of ducts

Never lay other utility marker tape or strip over ESB ducts

Never lay ESB marker tape or strip over other utility pipes

4C Specification for duct surround material

The thermal resistivity of the duct surround material must be maximum 0.10 m²k/Watt @95% moisture content. Only ESB approved unwashed sand graded to BS882 standard or equivalent ESB approved material is acceptable.

Duct surround material must be well compacted around ducts without damaging the ducts

NB. Pea gravel and foam concrete are unacceptable ESB duct surround materials

4D Specification for Installation of Ducts at sharp route bends

ESB Approved Long Radius Bend (minimum Duct Bend Radius 1.2 Metres) Bends less than 1.2 m radius are unacceptable

400mm 10N Minimum strength concrete on inside of bend to withstand cable pulling forces

Cross Section at bend

Showing concrete support all around the duct and increased trench width

Wider trench to accommodate 400mm of concrete on inside of bend

Normal Trench Width

6A Specification for Installation of Ducts at gentle sweep bend positions

Sharp Inner end of duct protrudes at joint due to bending stiffness. Never bend ducts as sharp ends will protrude at joints as illustrated; result serious ripping/damage to cable

Always use a series of 11, 22 or 45 bends to provide a smooth joint interface where the trench route curves around in a large sweep. Never bend ducts around a large sweep trench

Concrete support as for Item 6A

7 Obligation of Duct Installer to minimise the number and severity of duct bends

The duct installer must minimise the number and severity of preformed bends in ground with obstructions and other utility service crossings by opening ground 12m ahead of backfilled duct, wherever practical to do so. This safety obligation, which may require use of steel platting, allows the duct installer to pick the least bendy duct route through utility crossings and obstructions. Otherwise, numerous sharp unrecorded duct route deviations will be present making cable installation considerably more difficult and less safe for the cable installer.

8 Standard for Brushing, Mandrelling Roping and End-capping of MV/LV Ducts

PC Code Rule 66:

- Thoroughly brushed and mandrelled to prove ducts against debris/annealed deflection
- Replied using 12mm polypropylene rope with parallel braids breaking load of 1.25kN – all rope joints to be properly spliced and PVC taped over. Approved Supplier Silver Strand Brushca Dingley, p/0172) 9309205 - 500m drum lengths available to minimise handling
- Dented using enamel against grit and water pulling into holes
- Polyurethane mandrel once mandrel wear indicators or grooves are worn down to 80% of the maximum mandrel wear indicator is to be changed
- Approved mandrels, both disposable and reusable types, are available from suppliers of approved ESB ducting
- Approved ESB Mandrel and End-capping suppliers

Brandson Agencies, Rathmore, Co. Wicklow, Phone 0464 239696 (Brushes & Mandrels)

S & A, Grange Industrial Estate, Kildare, Phone 046 471 736 (Brushes only)

Cranendall Ltd, Kildare, Phone 062 772 5505 (Brushes & Mandrels)

Tyneham Network Systems, Longstreet, Co. Liffey, Phone 00 44 871 206 (Brushes & Mandrels)

125mm & 150mm PCU Duct Size

150mm & 160mm PCU Duct Size

Mandrel

Brush

Mandrel

Mandrel

Mandrel

Mandrel

Mandrel

Mandrel

Mandrel

Mandrel

Mandrel

Mandrel

Mandrel

Mandrel
9 Guidance on Correct Direction to Lay Spigot and Socket Ducting

- **Case 1** Duct run with all bends at one end
  - Correct direction as cable duct will be located at bendy end

- **Case 2(a)** Bendy no matter which side route is looked at
  - No best direction to lay ducts

- **Case 2(b)** More bends at one end than the other
  - Correct direction

- **Case 3** Trenching routes longer than 500m
  - Joist Bay
  - Treat any route as a series of lengths between joint bays at say 500m intervals and lay ducting as for Case 1 & 2 above
  - If on large sloping route lay as shown

10 Approved ESB Ducting for MV/LV Cables

- Use only solid wall high impact resistance ESB approved PVC red ducting to IS 370 colour standard and ESB specification 16113 (3.8mm minimum wall thickness)
- Discoloured or unidentified ducting not acceptable. All duct material must be approved by ESB Networks.
- Lightweight flexible corrugated twinwall ducting is not acceptable to ESB irrespective of manufacturer
- Current approved Duct and duct bend manufacturers are: Lynplast (bend fittings only) Radius Systems, Wavin, Quality Plastics, MFP Plastics, Cork Plastics, Emittel

11 Specification for Duct Jointing for MV/LV Cables

- Mallet or Hammer
- Timber block to protect end of duct from damage
- Fully jointed Duct Marks
- All ducts to be securely jointed by tapping against timber board on each duct until the black depth insertion mark is reached

12 Repair of Existing Ducts

- Use only approved slip couplers from approved manufacturers in section 9
- Damaged Duct Section
- Slip Coupler
- Slip Coupler
- Cut out damaged section of duct and ensure all cut surfaces are square and free from sharp edges
- Slide, position and centre the repair couplers on the centering marks

13 Sealing of Ducts

- All ducts to be permanently sealed at both ends of duct run
- Ducts to be temporarily sealed during installation using endcaps provided with each bale
- See pg. 213 of MV/LV Manual

14A Cross-Sectional Drawing of Backfilling in Front of MV Substation

- Preformed Earth mat
- SAFETY WARNING!!
  - Earths are an essential safety system: Connection will not be made available until they are installed.

14B Plan View of Ducting in Front of Substation

- See pg. 212 of MV/LV Manual

17A Supporting ESB Cables/Ducts During Trenching Works

- See pg. 42 of MV/LV Manual

17B Supporting ESB Cables/Ducts During Trenching Works

- Key in timber plank (150mm x 50mm) firmly into trench wall above ESB cable to protect it from failing debris/accidental contact etc
- Remove plank prior to backfilling reinstatement
- 0.3m minimum standard clearance or 100mm minimum bulge protection as in Table 7 of ESB manual

18 Avoidance of Cable Damage Due to Improper Backfilling at Cable Crossings

- Trench AFTER improper backfilling and Ramming
  - Excessive deflection resulting in a sheathing action at the conch walls and risk of cable or duct failure later

- Trench AFTER correct backfilling and Ramming
  - Laying all round the cable to be hand tamped
  - Cable to be well supported by firm bed of sand beneath the cable. No compaction machinery directly over cable/duct for 300mm minimum distance
  - Re-lay on top of sand and tamp if necessary
  - Very little cable deflection and sheathing at edge of trench
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**MV/LV Trench Dimensions & Duct Clearances for 125mm Ducting Layouts**

**Minimum Trench Widths for 1 & 2 Rows of Ducts**

<table>
<thead>
<tr>
<th>Ducts</th>
<th>Minimum Width (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>325</td>
</tr>
<tr>
<td>2</td>
<td>525</td>
</tr>
<tr>
<td>3</td>
<td>875</td>
</tr>
<tr>
<td>4</td>
<td>1150</td>
</tr>
<tr>
<td>5</td>
<td>1425</td>
</tr>
<tr>
<td>6</td>
<td>1700</td>
</tr>
</tbody>
</table>

**Minimum Trench & Duct Depths for 1 Horizontal Row of Ducts**

<table>
<thead>
<tr>
<th>Location of Trench</th>
<th>Minimum Trench Depth (mm)</th>
<th>Minimum Duct Depth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Housing Estate</td>
<td>975</td>
<td>1125</td>
</tr>
<tr>
<td>Existing Footpaths</td>
<td>975</td>
<td>1125</td>
</tr>
<tr>
<td>Existing Footpaths</td>
<td>600</td>
<td>750</td>
</tr>
<tr>
<td>Catering or New Public Sector</td>
<td>925</td>
<td>1125</td>
</tr>
<tr>
<td>Catering or New Public Sector</td>
<td>600</td>
<td>750</td>
</tr>
</tbody>
</table>

**Minimum Trench & Duct Depths for 2 Horizontal Rows of Ducts**

<table>
<thead>
<tr>
<th>Location of Trench</th>
<th>Minimum Trench Depth (mm)</th>
<th>Minimum Duct Depth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Housing Estate</td>
<td>1050</td>
<td>1200</td>
</tr>
<tr>
<td>Existing Footpaths</td>
<td>600</td>
<td>750</td>
</tr>
</tbody>
</table>

20A **Bridge Crossings: Restricted Footpath Designs**

1. The design must be agreed with the bridge authority. Position in footpath is preferred.
2. Minimum cover over ducts on footpath 100mm.
3. Where duct cover is > 300mm, marker strip & surface marker plates can be used.
4. Red uPVC ducting is not suitable for cable run external to bridges.
5. Where possible galvanised steel/stainless steel piping should be used, all joints must be free of weld burns on inside. Alternatively heavy duty 10mm wall thickness black HDPE material with cast steel marker plates attached must be used to permanently warn of presence of electric cable.

21A **River/Stream Crossings: Standard Where Burial/Drilling is possible**

See pg. 168 of LV/LMV manual

21B **River/Stream Crossings: Standard Where Burial/Drilling is not possible**

See pg. 168 of LV/LMV manual

22A **Minimum Standard Over Basements/Carparks**

Minimum depth of duct is 400mm.

Minimum thickness from bottom of duct to underside of slab is 200mm.

ESB surface marker plates are to be placed at approximate intervals of 3 metres on the top and bottom surfaces of the slab.

Marker plates are to be cast level with the surface and screwed down to to avoid lift off (ESB code: 3221712)

For ESB Ducts concrete surround - same strength for entire slab
25B

LV Ducting for Non Domestic Connections
Duct laid to Mini Pillar Location

The new duct must only be put into the vault with an ESB Networks person present.

If no vault in front of minipillar, the limit of excavation must be agreed with ESB Networks personnel locally. Temporary and permanent reinstatement to Local Authority Standard.

If the meter box is external then the cable is to follow:
Route 1

If the meter box is internal then the cable is to follow:
Route 2

External Wall

Warning tape @ max depth of 300mm

Depth of duct: 450 for existing footpath; 750 for duct in roadway

22 degree bend

Grade down to 600

125mm Duct + Reducing bend 125/80
ESB Code 9317609

Existing Cables
Vault

7m

Internal location option
(not >2m from external door, see “National Code of practice for Customer Interface”)

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Specification for Standard Non-Scheme Domestic Underground Service to an Outdoor Meter Cabinet (low-voltage service not exceeding 50m) from an Overhead Network

The Customer must ensure that:

- The service pole and the complete run of the duct are both within the site boundary. ESB's Engineering Officer will confirm the service pole position and the ducting route on-site.
- An outdoor meter cabinet, to ESB Standard 12-3 (1998), is installed in a suitable location, see overhead.
- An ESB approved “hockey stick” is installed at the meter cabinet position.
- Red ESB approved 50mm service ducting is installed at a minimum depth of 600mm between the hockey stick position and the service pole. Yellow ESB cable warning tape must be installed at a maximum depth of 300mm below ground level along the full length of the duct.
- Corrugated Ducting of any colour is not permitted.
- The duct shall be as straight as possible and free of sharp bends.
- A continuous and strong 10mm polyethylene draw rope is installed in the duct. It must be free of knots and secured at both ends of the duct.

Notes:
1. It is essential that the ESB cable does not come into contact with the cavity insulation. Allow a projection of 25mm of the hockey stick into the base of the cabinet.
2. There must be a minimum clearance of 100mm between the service duct and other services on the householder's property.
3. ESB will provide black UV light-resistant ducting from below the finished ground level to the top of the service pole.
4. For poles more than 50m away from the cabinet, 125mm red ESB approved ducting shall be used with an ESB approved service vault at the junction of the duct and the hockey stick.

Connection will only be made after all above requirements are met.

ESB yellow warning tape at max. depth of 300mm below finished ground level (F.G.L.)

Red ESB approved 50mm Solid Wall MDPE duct @ 600mm min. depth below (F.G.L.)

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